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广东南雄古新世一新的裂齿类[1)]

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摘要 记述了广东南雄盆地早～中古新世上湖组上部发现的裂齿目一新属新种——杨氏华南兽(*Huananius youngi* gen. et sp. nov.)。新属在上、下前臼齿不臼齿化,上臼齿无次尖,下臼齿三角座和跟座均呈V形等方面显得原始。但在颊齿单面高冠,上臼齿原尖前、后脊分别与前、后附尖相连,小尖发育,具初始的次尖架,下臼齿略呈双曲拱柱状,具下后附尖等方面显示了向典型的裂齿类方向发展。

关键词 广东南雄,早～中古新世,裂齿目, 华南兽

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裂齿目是一类古老的绝灭的哺乳动物,地史分布很短,化石只发现在北美和欧亚大陆的古新世和始新世地层中。它同时也是一类分异不大的哺乳类,仅知1个科——凿食兽科(Esthonychidae)。北美发现的属种较多,研究得也较深入,至目前为止已记述过5个属(*Esthonyx*, *Trogosus*, *Tillodon*, *Megalesthonyx*和*Azygonyx*)约十几个种(*Gazin*, 1953; *Gingerich*, 1989; *Gingerich and Gunnell*, 1979)。欧洲仅有1～2个属(*Plesiesthonyx*——有人认为它是*Esthonyx*的同物异名,和*Franchaius*)(Chow *et al.*, 1996)。亚洲原发现的裂齿类化石并不多,确定的只4个属——猴裂兽(*Adapidium*)、官庄兽(*Kuanchuanius*)、钟健兽(*Chungchienia*)和*Basalina* (Young, 1937; Chow, 1963; Lucas and Schoch, 1981)。但近40年来随着华南红层研究的进展和中国古新统的发现,报道了一些新属种——小尖兽(*Meiostylodon*)、中间犸(*Interogale*)和安琪掠兽(*Anchilestes*)(周明镇等,1977; 王伴月,1975; 丁素因和郑家坚,1989)。

本文记述的新属种,标本采自广东南雄盆地的早～中古新世上湖组上部,它与以往发现的化石一起,对研究裂齿类的起源和分类均很有意义。

1 标本记述

裂齿目 Tillodontia Marsh, 1875

凿食兽科 Esthonychidae Cope, 1883

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杨氏华南兽(新属新种)　*Huananius youngi* gen. et sp nov.

(图版 I; 图 1~2)

正型标本　一右上颌骨带颊齿 P3~M3 和同一个体的右下颌骨附颊齿 p3~m2(V11700)。

产地及层位　广东省南雄县增德凹附近(78001),早~中古新世上湖组上部。

特征　小型裂齿类。上、下颊齿单面高冠现象较显著。上臼齿外架较深,中附尖不与外脊相连,前、后附尖明显,有较强的后尖肋,前小尖和后小尖发育,无次尖。下臼齿三角座和跟座均呈 V 形,夹角小且近等，稍呈双曲拱柱状。

词义　属名表示化石产地我国南方,种名赠给最早研究中国裂齿兽化石的已故杨钟健教授。

描述　P3~M3 紧密排列,无齿隙。P3 和 M3 齿冠已破碎,M1 也略有破损,唯 P4 和 M2 保存较好。上颊齿单面高冠,舌面明显高于唇面。P3 冠面近似等边三角形,三齿根。P4 呈横宽的等腰三角形。外架较深。外脊呈 V 形,向内伸达牙齿宽度的一半。前尖(前尖和后尖合尖)高大,外脊由此分别伸向前、后附尖,但外脊前脊比外脊后脊高。原尖也呈 V 形,位于前尖的正内方,比前尖低。原尖前脊已破损;原尖后脊比较低长,直伸至后附尖的后内基部。具萌芽状的后小尖。仅在牙齿内侧发育有前、后齿带,且在原尖内侧中断。

上臼齿呈横宽的长方形,外壁稍长于内壁。M1 齿冠外侧已破损,但仍可看出外脊呈 W 形,接近齿宽之半。前尖和后尖大小可能近等。中附尖很发育,不与外脊相连。原尖大,位于牙齿内侧中部,其内壁陡直。原尖前脊和原尖后脊分别伸向前附尖和后附尖基部。前、后小尖明显。前、后齿带低,仅在牙齿内侧发育,且在原尖内侧中断。后齿带比前齿带强,似有次尖架发育。

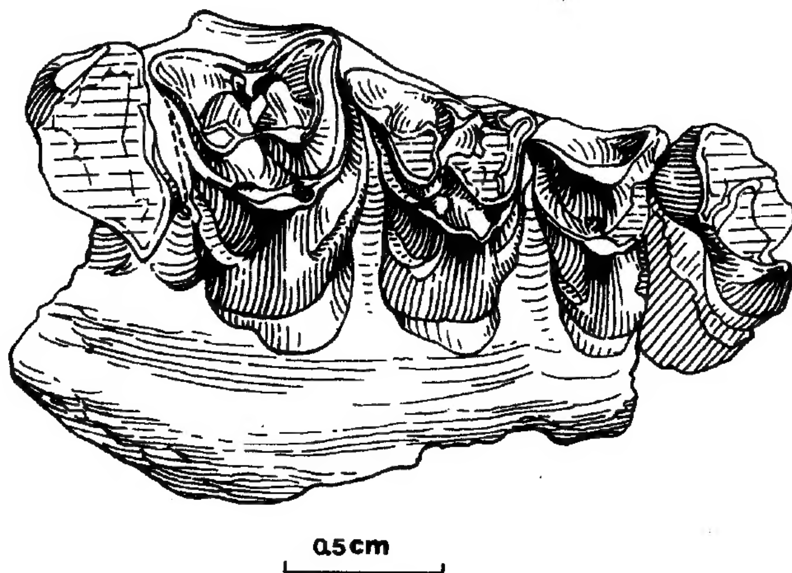


图1　杨氏华南兽(新属新种)的右上颌骨附颊齿P3~M3(V11700)

Fig.1　Right upper jaw with P3~M3 (V11700) of *Huananius youngi* gen et sp. nov.

M2形状似M1,但比M1大得多。外架较深。W形外脊向内伸不到齿宽之半。前尖比后尖略高大,均呈新月形。前尖外壁较平缓,前尖肋不强;后尖外壁较陡,后尖肋很粗壮。外脊在前尖和后尖之间较凹陷。中附尖呈三角锥状,比在M1中稍小。前附尖和后附尖均大而突出,伸向前附尖和后附尖的外脊均很高。原尖呈新月状,内壁陡峻,位于牙齿内侧稍偏前。原尖前脊高,稍向前凸呈弱弧状伸向前附尖的前基部。原尖后脊比原尖前脊低,伸向后附尖的后基部。前小尖比后小尖大,且靠近原尖。牙齿釉质表面中间较粗糙,有小瘤或褶皱。外齿带不宽,但位置较高。前、后齿带较发育,尤其是后齿带似发育成弱的次尖架,但集中在牙齿的内一半,位置相对较低,其高度约为原尖的二分之一,且在原尖内侧中断。上颊齿测量见表1。

表1 杨氏华南兽(新属新种)的上颊齿测量

Table 1 Measurements of upper cheek teeth of *Huananius youngi* gen. et sp. nov. (mm)

	P4	M1	M2	P3～M3	P3～P4	M1～M3
长(沿外缘)L(along external margin)	3.5	5.2	5.4	21.0*	8.0*	13.2*
宽(沿前缘)W(along anterior margin)	6.3	7.2	8.0			
宽长指数 宽(W)/长(L)×100	180	137	148			

* 为近似值。

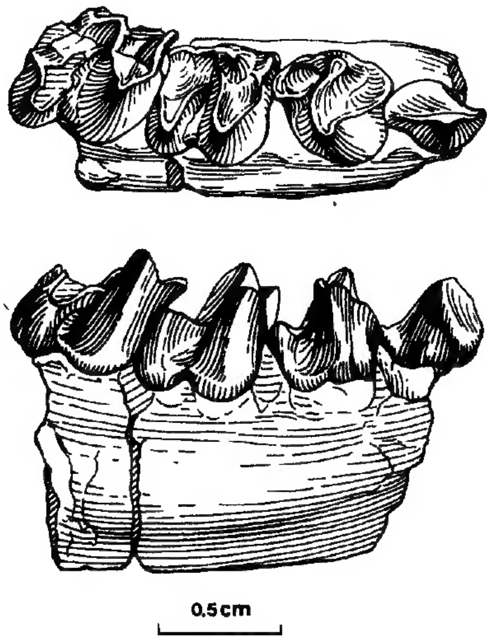


图2 杨氏华南兽(新属新种)的右下颌骨附颊齿p3～m2(V11700)上,冠面观; 下, 唇面观

Fig.2 *Huananius youngi* gen. et sp. nov. Right lower jaw with p3～m2 (V11700) upper, crown view; lower, labial view

下颌骨在m1三角座之下唇、舌面深度分别为6.2和8.5mm。保存的4个下颊齿,特别是前后端的两个牙齿均有不同程度的破损。下颊齿单面高冠,唇侧高度比舌侧大得多。p3前侧破损,三角座主要由一高大的主尖组成,侧扁,外壁稍凸,内壁较平。主尖的顶端有脊伸向牙齿的前后侧,其中后脊较强,直伸至雏形跟座的中部稍偏外侧。跟座上的尖未分化。p4三角座前后压缩,横向较宽。下原尖和下后尖都很高大,下前尖破损,从残存部分看可能低小。跟座低,跟座盆小,在下后尖之后牙齿的内三分之一处呈圆形,其上有初始的或不明显的下次尖和下内尖。

两个下臼齿形态相似,近方形。m2比m1稍大一点,都多少有点双曲拱柱状。三角座和跟座均呈V形,两者夹角约相等或前者稍大于后者,夹角很小,约30°。下原尖高大,呈新月形或V形。下后尖大而突出,下前尖小,紧挨在下后尖的前方。下前脊和下后脊发育程度相等,都比较弱,且

在中间凹陷。下后附尖明显，形成下后附尖叶紧贴在下后尖之后方。下次尖形态与下原尖相近，只略低小。下斜脊向内伸，与下后附尖叶相接，因而十分靠内。牙齿的外中凹深。下内尖比下次尖小，似无下次小尖。下颊齿测量见表 2。

表2　杨氏华南兽(新属新种)的下颊齿测量

Table 2　Measurements of lower cheek teeth of *Huananius youngi* gen. et sp. nov. (mm)

	p3	p4	m1	m2	p3～m2	p3～p4	m1～m2
长(L)	3.8	4.1	4.2	4.7	17.2	7.8	9.4
宽(W)	2.3	3.7	4.2	5.0			

2　问题讨论

裂齿类的主要特征是上、下第二门齿增大，上、下第一前臼齿缺失。颊齿单面高冠。后面的上、下前臼齿臼齿化程度高。上臼齿多具次尖和次尖架。下臼齿的三角座和跟座几乎等大，呈双曲拱柱状，具下后附尖。从南雄的材料看，上、下颊齿单面高冠，上臼齿的前、后齿带在内侧比较发育，有弱的次尖架，小尖发育。p4 具小的圆形跟座。下臼齿略呈双曲拱柱状，三角座和跟座大小近等，有较明显的下后附尖。因此，可以把它归属裂齿类。但与已知凿食兽科典型成员相比，区别仍很大，多数特征显得原始。

裂齿类虽有上述许多典型特点，但在材料不全的情况下，早期裂齿类与钝脚类(Pantodonta)的某些原始类群仍难区分，以至有误定或无法鉴定的情况发生。丁素因和郑家坚(1989)在研究 *Interogale* 和 *Anchilestes* 归属问题后明确指出，原始的裂齿类和钝脚类(全齿类)上臼齿的基本结构是不同的。前者的原尖前脊和原尖后脊分别通过前小尖(原小尖)、后小尖向外伸至前、后附尖处，有次尖、次尖架及前齿带；而后者原尖的“V”形脊分别伸达前尖和后尖基部，有内齿带，无次尖和次尖架。南雄上臼齿的原尖前脊和原尖后脊分别伸至前、后附尖，小尖发育，有前、后齿带和弱的次尖架。因此，丁素因等的观察更加证实了本文记述的南雄标本应属裂齿目。

笔者同意丁素因等(1989)的意见，南雄盆地发现的小迷兽(*Dysnoetodon minuta*——张玉萍，1980)分类位置有问题，正、副型标本形态不一，但都不属裂齿类，大小也与我们的标本相去甚远。同一盆地发现的原归入裂齿目的罗佛寨兽(*Lofochaius*)，因上臼齿形态明显相似于钝脚类而被丁素因等排除在裂齿目之外。这样，原在我国发现的古新世裂齿类只有 3 个属种——粗糙安琪掠兽(*Anchilestes impolitus*)，枣市小尖兽(*Meiostylodon zaoshiensis*)和大塘中间猬(*Interogale datangensis*)。

本文新建的华南兽与上述 3 属原始裂齿类均易区分。与我国最原始的裂齿类潜出盆地望虎墩组下部发现的安琪掠兽相比，两者的上颊齿均横宽，表面较粗糙。上臼齿均具前、后附尖，中间棱不明显。下臼齿的三角座和跟座均呈 V 形，下后脊(下原脊)后壁陡直，与下前脊之间夹角小。但两者之间的差别仍相当大。华南兽与安琪掠兽的上颊齿均横宽，但前者横宽的程度远不如后者大。华南兽的上臼齿原尖前脊和原尖后脊较安琪掠兽强，而次尖架较安琪掠兽的弱，且后者具初始的次尖(在 M2 中与原尖在冠面上以一沟相隔)。上、下颊齿单面高冠现象前者强后者弱，前者的下臼齿多少有点双曲拱柱状。

华南兽与同盆地发现的中间狉区别主要在于：下颊齿单面高冠现象显著，下臼齿双曲拱柱状较明显，下后附尖发育，下斜脊靠内，跟盆小。而中间狉下颊齿的齿冠相对较低，单面高冠现象非常轻微。下臼齿看不出双曲拱柱形，下后附尖无或不明显。跟座比三角座还长。下斜脊靠外，约与下后脊后壁中部相连，故盆形跟座大，有些近似狉类。华南兽个体比中间狉大，比安琪掠兽更大(表1,2)。

在早期的裂齿类中，华南兽与时代相近的发现在湖南茶陵盆地的小尖兽最为接近。这表现在：上臼齿均呈横宽的长方形，前、后尖相对大小及形状相近，前小尖和后小尖均很发育，均有较高的外齿带和低而明显的前、后齿带及初始的次尖架。但两者仍易区分。华南兽上臼齿的前附尖和后附尖均很发育，后尖肋十分粗壮，前、后齿带位置相对较低，仅为原尖高度之半。牙齿表面较粗糙，有小瘤或褶皱。而小尖兽上臼齿的前附尖未保存，情况不明，后附尖不明显。次尖架更明显，前、后齿带位置相对较高，约为原尖的四分之三。牙齿中间光滑无小瘤或褶皱。华南兽的尺寸也比小尖兽小，而且牙齿相对显得窄长(表1)。

关于裂齿类的起源与分类问题，长期以来有争论。Gazin(1953)在系统研究北美发现的裂齿类时，首次注意到这一目与钝脚类的关系。继而周明镇等(1979)也持同样的观点，认为裂齿类与钝脚类的关系最近，可作钝脚目的一个亚目。Van Valen(1963)认为裂齿目可能起源于踝节目，并将它作为踝节目的一个亚目。Rose (1972)觉得Van Valen的分类过于加重本已分化复杂的踝节类，而且中始新世的裂齿类已很分化，建议仍保留目的分类位置。Lucas(1993)也认为裂齿类应保留目级分类阶元。丁素因等(1989)在研究*Interogale*和*Anchilestes*属分类位置时，也持同样观点，认为裂齿类应独立成目，而且与狉兽目有较近的亲缘关系。本文研究的华南兽表明，在早～中古新世时就已出现较为典型的(虽然有些特征是初发的)裂齿类，而且已经有相当程度的分化，目前所知至少已有4个属种，因此它应该是一单独的目。它和其他类群的共同祖先应在古新世以前的地层中找寻。起源的地区似可肯定为亚洲。

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A NEW TILLODONT FROM THE PALEOCENE OF NANXIONG BASIN, GUANGDONG

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Key words Nanxiong, Guangdong, Early～Middle Paleocene, Tillodontia, *Huananius*

Summary

Tillodontia is an old and extinct mammalian order, ranging from Paleocene to

Eocene in North America and Eurasia. It is also a small group of Mammalia, including only a single family—Esthonychidae. Fossils in North America have been studied throughly and five genera (*Esthonyx*, *Trogosus*, *Tillodon*, *Megalesthonyx* and *Azygonyx*) were recorded. One or two genera (*Plesiesthonyx*—someone thought it was a synonym of *Esthonyx*, and *Franchaius*) were reported from Europe. In Asia, three Paleocene genera *Meiostylodon*, *Interogale* and *Anchilestes*) apart from four Eocene genera (*Adapidium*, *Kuanchuanius*, *Chungchienia* and *Basalina*) have been studied in the past. In the present paper was described a new genus and species, *Huananius youngi* from the Paleocene of Nanxiong Basin, Guangdong Province.

Tillodontia Marsh, 1875

Esthonychidae Cope, 1883

***Huananius youngi* gen. et sp. nov.**

(figs. 1~2; pl. I)

Type A fragmentary right upper jaw with P3~M3 and a part of right lower jaw with p3~m2 of same individual (V11700).

Locality and horizon Zengdeao village, Nanxiong County, Guangdong Province; upper part of Shanghu Formation, Early~Middle Paleocene.

Diagnosis Small tillodont. Cheek teeth unilaterally hypsodont. Upper molar with wide stylar shelf, distinct parastyle, mesostyle and metastyle, well developed paraconule and metaconule, strong metacone rib, and hypocone- shelf but without hypocone. Lower molar with V-shaped trigonid and talonid, nearly equal angule and very small, and distinct metastylid.

Etymology Huanan, South China, where the fossil was found; Young, in honour of late Professor Chungchien Young, who is the first one studing Chinese tillodont.

Description Upper cheek teeth are unilaterally hyposodont, the lingual side higher than the labial. P3 is nearly equilateral triangular in outline, three-rooted. P4 is transversely wide, isosceles triangular in shape. Stylar shelf is deeper and ectoloph is V-shaped which extended inwards less than half of tooth width. The paracone (or combined para-metacone) is large and high. The protocone is also V-shaped, situating at inner side of the paracone, but lower. The preprotoloph was broken away, the postprotoloph is low and long, arriving the posterointernal base of the metastyle. There is rudimentary metaconule.

The first two upper molars are both nearly rectangular in outline, transversely wide, external wall being a little longer than the internal. Ectoloph of M1 is W-shaped, extending inward nearly half of the tooth width. The protocone is big, situating at middle of inner side of the tooth. Preprotoloph and postprotoloph extend to the bases of the parastyle and metastyle, respectively. Both paraconule and

metaconule are distinct. Pre– and postcingula are low, existing at inner parts of the anterior and posterior margins, but disconnected at inner side of protocone, and the former being weaker than the latter, which is somewhat like hypocone–shelf.

M2 is similar to M1 in shape, but bigger. W–shaped ectoloph extended inward less than half of tooth width. The paracone and metacone are crescent, the former being a little bigger than the latter. The paracone rib is very weak while the metacone rib is strong. Parastyle, mesostyle and metastyle are well developed. The preprotoloph is high, extending to the anterior base of the parastyle while the postprotoloph is lower and extended to the posterior base of metastyle. The paraconule is bigger and nearer to the protocone than the metaconule. The ectocingulum is narrow but high. The pre– and postcingula are like those in M1 but hypocone–shelf is well developed.

The lower cheek teeth are also unilaterally hyposodont, with the labial higher than the lingual. Anterior part of p3 was broken. Trigonid of p3 is composed mainly of a high cusp, from tip of this cusp there are crests forwards and backwards, the latter is stronger and extends to the rudimentary talonid, like cristid obliqua. The trigonid of p4 compressed anteroposteriorly, transversely wider. The paraconid was damaged, probably low and small seen from the remaining part. Both protoconid and metaconid are big and high. The talonid is low and talonid basin is very small. There are rudimentary hypoconid and entoconid.

m1 and m2 are both quadrate in outline, but the latter being a little bigger than the former. Both trigonid and talonid are V–shaped, with nearly equal small angle (about 30°). The paraconid is small, near the metaconid. The metaconid and protoconid are high and large. The paralophid and metalophid are weak and concave in the middle. The metastylid is very distinct, forming a metastylid lob close to posterior side of the metaconid. The hypoconid is smaller than the protoconid. The cristid obliqua connects the metastylid lobe, so it is very internally situated. The hypoflexid is deep. The entoconid is smaller than the hypoconid.

Discussion The main characters of Tillodontia are as follows: upper and lower second incisors enlarged; cheek teeth are unilaterally hyposodont; upper and lower first premolars are absent; rear upper and lower premolars are more molariform; upper molars often have hypocone or hypocone–shelf; lower molars have equal angles of trigonid and talonid, and metastylid. The following features can be seen from the Nanxiong material: cheek teeth are more unilaterally hyposodont; upper molars have more developed pre– and postcingula and weak hypocone–shelf, and distinct conules; p4 possesses small rounded talonid; lower molars have nearly equal angule of trigonid and talonid, and pronounced metastylid. So Nanxiong specimen undoubtedly belongs to Tillodontia.

It is very difficult sometimes to distinguish certain early tillodonts from pantodonts if the specimens are not in good preservation, although Tillodontia has many typical properties listed above. Ting and Zheng (1989) pointed out clearly that the upper molar structure of Tillodontia is different from that of Pantodonta. Tillodont's upper molar has hypocone or hypocone–shelf and anterior cingulum, and pre– and postprotoloph extend to parastyle and metastyle, respectively; Pantodont's upper molar has internal cingulum but no hypocone or hypocone–shelf, its pre–and postprotoloph extend to the bases of paracone and metacone, respectively. Upper molars of Nanxiong specimen described in the present paper have more developed conules, anterior cingulum and weak hypocone–shelf, and pre– and postprotoloph extending to parastyle and metastyle, respectively. So Ting and Zheng's opinion is in accordance with our classification.

The present authors agree with Ting and Zheng (1989) to that both *Dysnoetodon* and *Lofochaius* are not tillodonts, and the latter is a pantodont mainly because its pre– and postprotoloph extend to the bases of paracone and metacone. Thus, up to present there are four genera and species— *Anchilestes impolitus*, *Interogale datangensis*, *Meiostylodon zaoshiensis* and *Huananius youngi* gen. et sp. nov. in the Chinese Paleocene. New genus differs from *Anchilestes*, the earliest tillodont known in the lower part of Early–Middle Paleocene Wanghudun Formation, in having more unilaterally hypsodont cheek teeth and relatively long upper ones, stronger pre– and postprotoloph, and relatively weak hypocone–shelf of upper molars. *Huananius* differs from *Interogale* mainly in having more unilaterally lower cheek teeth, distinct metastylid, internally situated cristid obliqua, and smaller talonid basin of lower molars. *Huananius* is bigger than *Interogale* and much bigger than *Anchilestes* (see table 1～2). New genus is more similar to *Meiostylodon* than to other early tillodonts, but still easy to distinguish. For instance, *Huananius* upper molar has more developed parastyle and metastyle, strong metacone rib, relatively lower pre– and postcingula, and small tubercle or wrinkle in center of tooth. Whereas *Meiostylodon* upper molar possesses indistinct metastyle, relatively high pre– and postcingula, and distinct hypocone–shelf, but no tubercle or wrinkle in the tooth center. *Huananius* is smaller than *Meiostylodon*, with relatively long upper molars (see table 1).

Origin and classification of Tillodontia have been disputed for a long time. Gazin (1953) proposed for first time that Tillodontia had some relationships with Pantodonta after he studied North America tillodonts. Later (1979) Chow and Wang had same idea with Gazin, stating that the two groups had closest relationship, and Tillodontia could be a suborder of Pantodonta. Van Valen (1963) considered Tillodontia might originate from Condylarthra and then placed it as a suborder of the latter. Rose (1972) felt Van Valen's view would complicate Condylarthra, and proposed Tillodontia should

be an order. Lucas (1993) had same opinion with Rose. Ting and Zheng (1989) thought that Tillodontia was a distinct order and had closest relationship with Anagalida after they studied the systematic position of *Interogale* and *Anchilestes*.

The present study shows that in the Early ~ Middle Paleocene the typical tillodont (though some features are still in the rudimentary stage) had already emerged and diverged. In Paleocene time there are four genera. So Tillodontia should be an independent order. It undoubtedly originated in Asia.

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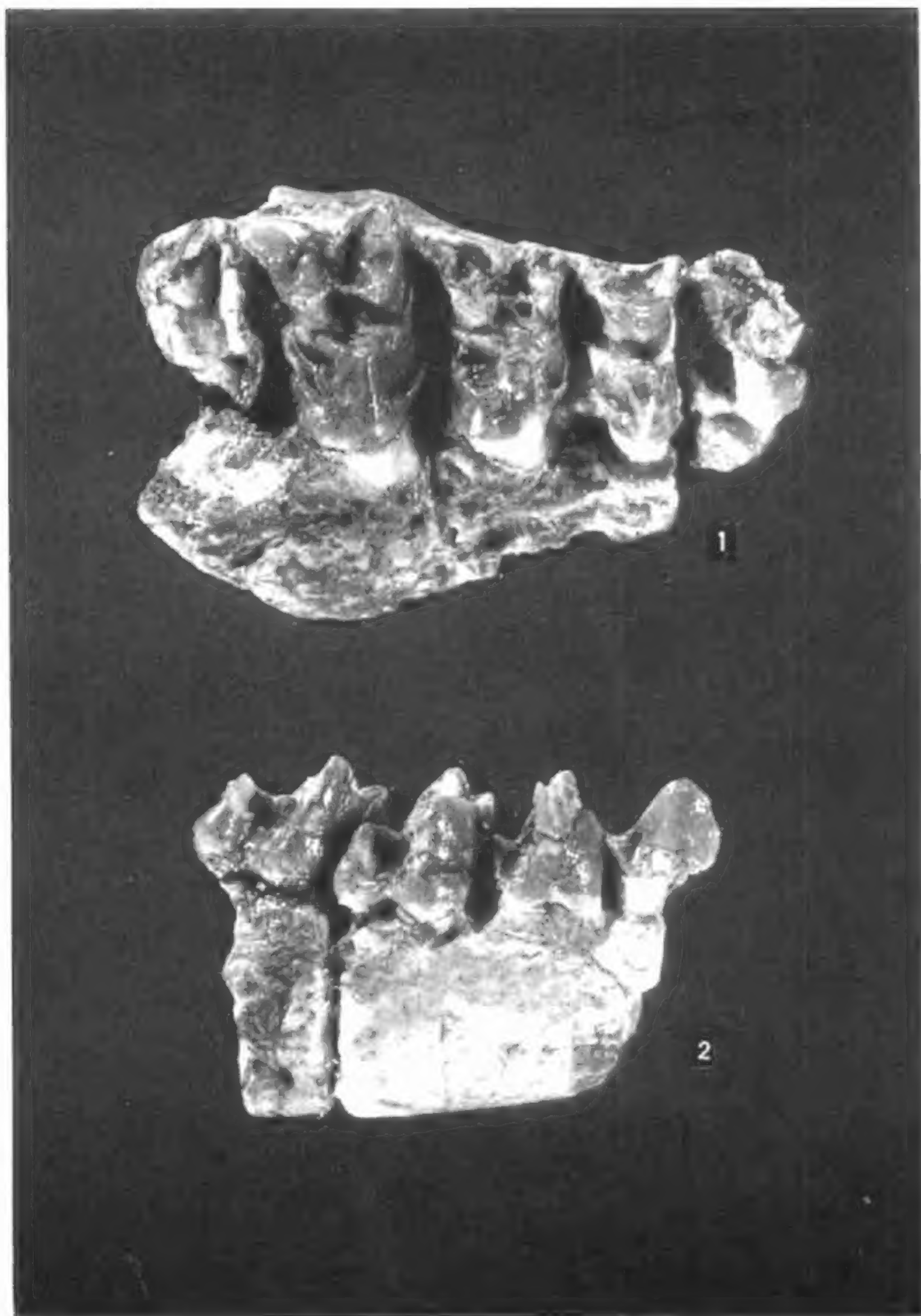
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图版 I 说明 (Explanations of Plate I)

杨氏华南兽(新属新种) *Huananius youngi* gen. et sp. nov. (V11700) × 4

1. 右上颌骨附颊齿 P3~M3 (right upper jaw with P3~M3), 冠面观 (crown view);
2. 右下颌骨附颊齿 p3~m2 (right lower jaw with p3~m2), 唇面观 (labial view)


1
2